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HOSPITAL TECHNICAL MEMORANDUM

PROTECTION OF CONDENSATE SYSTEMS: FILMING AMINES

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MINISTRY OF HEALTH : LONDON : HER MAJESTY'S STATIONERY OFFICE

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Protection of Condensate Systems: Filming Amines

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I. Scope

1. The condensate from a steam boiler installation frequently contains oxygen and carbon-dioxide in solution. Such condensate will cause corrosion of unprotected steel pipes and other steel or iron components of the condensate return system. One method used for the protection of condensate systems liable to attack involves the addition to the steam systems of amine compounds. These protect the system in two ways; neutralising amines act as direct neutralisers of the carbon-dioxide in the condensate; and filming amines form a molecular film on the internal surface of the pipes to prevent oxidation. This memorandum discusses the application and control of amine compounds and precautions to be observed in their use.

II. General

2. The term "amines" covers a large group of organic compounds having varying degrees of toxicity. Neutralising amines include compounds such as morpholine and cyclohexylamine and are poisonous. They act as direct neutralisers of carbon-dioxide and, for certain applications, are being superseded by filming amines.

3. Filming amines employ octadecylamine as the most suitable compound, available as an emulsion or as octadecylamine acetate salt, soluble in water. They can be made of lower toxicity and applied in smaller concentration than the neutralising type.

4. With the object of overcoming certain special difficulties (notably acidity in boilers, mild steel tanks, pumps, etc., insolubility with other water treatment material of the acetate form, and the increased cost and bulk of the emulsion) a form of filming amine has been developed which is claimed to be an improved form of octadecylamine. It contains no acetic acid, and is blended with an emulsifier which is itself a filming amine, thus providing a 100 per cent. filming material. It is slightly alkaline in solution and compatible to some extent with other feed water treatment compounds.

III. Application in hospitals

5. As far as is known, filming amines are the only kind being used at the present time in boiler plants in National Health Service hospitals.

6. They are obtained and applied in the following ways: in solid form as tablets administered through a dispenser on the boiler; as a solid form amine which is emulsified and injected into the steam or condensate return mains by a proportioning pump; and as an emulsion, which may or may not require to be diluted, which is also injected into the steam or condensate return mains by a proportioning pump.

7. Specific dosage rates cannot be quoted since they can be determined only by operating experience with each individual system. Representative manufacturers suggest that an amine concentration of 0·5 parts per million *in the condensate* should be satisfactory in low make-up systems and 1·5 parts per million in average industrial installations. The minimum dosing required to inhibit corrosion should be used, but under no circumstances should a concentration of 3·0 parts per million in the condensate be exceeded. A factor to be borne in mind is that filming amine already deposited may be re-evaporated, thus causing local concentrations higher than the dosage rate.

Dosing methods—proportioning pumps

8. Accurate dosing methods should be employed. The only satisfactory method is to apply the amine in fluid form of a specific concentration by means of a proportioning pump coupled to the main boiler feed water pump. The proportioning pump should inject the liquid into the feed line as close to the boiler as possible. Injection of the fluid into a saturated steam-line may not be satisfactory since complete vapourisation is difficult to attain.

Tests

9. Two types of tests are available, qualitative and quantitative. The qualitative tests merely indicate the presence or otherwise of amines in the condensate. The quantitative tests show the actual concentration and are the only positive way of checking. They involve the application of specialised techniques which, although straightforward, require care in execution. Advice on these is obtainable from the makers of the testing equipment.

10. It is necessary for the level of amine concentration to be checked at frequent intervals. Test samples may be taken either from a steam main and condensed or from a condensate line.

11. The sampling should be taken via a cooling coil (to prevent flash) from a flowing line rather than a condensate receiver. A commercially made sampling unit is available for taking samples from a steam line. Alternatively, the sample may be obtained from a slow running draw-off cock at low level on a condensate return line, provided no flashing occurs.

12. Filming amines in water are rapidly adsorbed on to the surface of glass or polythene. To prevent this the collecting vessels should be treated with a silicone.

13. The test sample must not be allowed to stand in the collecting vessel for more than one hour. Synthetic detergents must not be used for cleaning these containers. Rinsing with distilled water is sufficient.

IV. Restrictions on use of amines

Cooking and food processing

14. No filming amines should be allowed to come into contact with food or foodstuffs: they have a particular affinity for milk and lard. Where (as, for example, in wet steaming ovens) steam comes into contact with food, or where it could do so fortuitously, a steam generator fed from the main steam line is necessary to provide steam completely free from filming amines. Regular tests should be carried out to ensure that the condensate from kitchen processes is free from amines as a precaution against the failure of a steam generator tube.

Sterilising

15. There is doubt about the amount of deposition of filming amines in sterilising processes employing steam containing amine, and about the effects such deposits might have on instruments, fluids, babies' feeding bottles, etc. Pending further study, the question of such applications should be the responsibility of the Hospital Medical Officer concerned in each case.

Distilled water

16. Where octadecylamine in the distilled water obtained from the condensate of steam supplies would be objectionable, it is claimed that the amine can be removed by passing the condensate through activated carbon filters.

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